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KNOWLEDGEABLE MODULES AND SERVICE CONTROLLERS

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Abstract

A new mode of operation between modules and crate controllers is proposed. A knowledgeable module contains an application program which performs the module's function. The program is executed by a processor in the service controller--a crate controller. This modularizes the software in the same way the hardware is modularized. Executing the program in a crate controller allows control of other modules and multiple module functions.

Introduction

With the advent of microprocessors (μP), much work in CAMAC has centered around installing processors locally in crates. The two systems most often proposed are smart modules and μP crate controllers. Knowledge modules and service controllers are a combination of these two systems.

Smart modules are complete packages with processors and programs built in. When installed in a crate, it appears as any other CAMAC module to the dataway. This does not

require programming support at the crate level. Smart modules are not easily upgraded or changed to new μP's. Also, they can not interact with other modules easily.

Crate controllers using μP are at the other end of the spectrum. They are very flexible, can control multiple modules and create complex functions. They do, however, require a great deal of support at the crate level--assemblers, systems and application programmers, and PROM programmers.

A knowledgeable module contains a program and temporary storage but not a processor. The program is executed remotely in a crate (service) controller. This allows control of multiple modules and standard CAMAC modules for complex functions. The programs are already modularized and require no programming support to implement at the crate level. The system can easily be upgraded or changed to another processor of the same word length.

Service Controllers

The service controller is a two-function device, performing both standard CAMAC dataway operations and memory cycles to knowledgeable modules on the dataway. The controller may be either an auxiliary or sole controller. If it is an auxiliary, its cycles must be interwoven with the needs of the other controllers.

The service controller services the knowledgeable module by seeking it out, by executing its program, and by

providing basic system programs. Instead of preprogramming locations and module types into the service controller, the service controller interrogates each module in crate to see if it is knowledgeable and is ready to be executed. When it finds a program to be executed, it sets it up as if the program were the only one and is independent of any other modules programs.

Examples of Knowledgeable Modules and Clusters

Temperature Modules

One application of knowledgeable modules is in temperature transducer modules. A family of modules oriented toward different transducers as PRT's, thermocouples, thermistor, etc. can be standardized. The program on the module can be used to linearize the device and standardize the output (A(o)). A standard output might be in degrees Celsius with the digits in BCD as:

±ccc.cc° Celsius c ≡ BCD Digit uses 21 Bits

This would greatly reduce the information needed by another computer to use the module. Also, changes between different transducers and temperature ranges need not effect any program changes.

Temperature Controller

Another application for knowledgeable modules is as temperature controllers. This a powerful tool because a

controller can be operated by an intelligent or adaptive program. This module would be used with a temperature transducer module in a cluster. The controller would have the necessary adaptive program, analog and relay contact outputs to operate an oven efficiently. The temperature module would provide the temperature sensing. The controlling program would always look to (N-1)·A(o) (relative addressing) for the current temperature (in the standard format). The reference temperature would also be written in the standard format.

Manual Controller

The above system can be easily placed in manual. A knowledgeable module with a manually setable register is used. This module writes the register to (N+2)·A(o) to set the reference temperature in the temperature controller.

Summary

A new mode of operation between CAMAC modules and crate controller is proposed. The primary purpose of this system is to reduce or eliminate software support at the crate level. The secondary purpose is to reduce software support in external (non-local) computers. The system is useable in many modes of operation from large multicrate systems to small manual systems.